

REMARKS

Applicants thank Examiner Hwa S. Lee for the telephone interview of January 25, 2005 with Applicants' Attorney, David T. Millers. During the interview, the above amendment of claim 7 and the rejection of claim 7 were discussed. No agreement regarding patentability was reached.

Claims 1-9 and 30-33 were pending in the above-identified application when last examined and stand rejected. The rejection was made final.

Pursuant to 37 CFR 1.116(b), Applicants request entry of the above amendment to the claims, which cancels claims 1-6 and amends claim 7 to comply with form requirements set forth in the Final Office Action as a rejection under 35 U.S.C. § 112, second paragraph. Applicants further request entry of the above amendment to place the claims in better form for consideration on appeal.

Claims 7-9 and 30-33 were rejected under 35 U.S.C. § 112, second paragraph. In particular, the Examiner indicated that claim 7 was unclear with regard to whether the beams go into the interferometer optics before or after the beam recombining unit. In response, the requested amendment of claim 7 more clearly recites, "interferometer optics that generate measurement and reference beams from a recombined heterodyne beam" and "a beam-combining unit positioned to receive the first and second beams and provide the recombined heterodyne beam to the interferometer optics." The amendment to claim 7 similarly improves the clarity of claims 8, 9, and 30-33, which were rejected for depending from claim 7. In view of the above amendment, Applicants respectfully request reconsideration and withdrawal of the rejection under 35 U.S.C. § 112.

Claims 1 and 3-6 were rejected under 35 U.S.C. § 103(a) as unpatentable over U.S. patent No. 5,793,487 (Takahashi) in view of U.S. patent No. 5,327,222 (Takamiya).
Claims 1 and 3-6 are canceled.

Claim 2 was rejected under 35 U.S.C. § 103(a) as unpatentable over Takahashi in view of Takamiya and further in view of U.S. patent No. 5,767,971 (Kawai). Claim 2 is canceled.

Claims 7-9 and 31-33 were rejected under 35 U.S.C. § 103(a) as unpatentable over Takahashi in view of Takamiya, U.S. patent No. 5,781,295 (Fuchs), and U.S. patent No. 4,492,426 (Nicia). Applicants respectfully traverse the rejection.

Independent claim 7 distinguishes over the combination of Takahashi, Takamiya, Fuchs, and Nicia at least by reciting, “a beam splitter positioned to split the heterodyne beam into a first beam and a second beam having different frequencies; ... interferometer optics that generate measurement and reference beams from a recombined heterodyne beam; and a beam-combining unit positioned to receive the first and second beams and provide the recombined heterodyne beam to the interferometer optics, wherein the beam combining unit comprises: a beam combiner; a first optic cable assembly that carries the first beam; a second optic cable assembly that carries the second beam to the beam combiner; and a first manipulator on which the first fiber optic cable assembly is mounted.”

Takahashi and Takamiya fail to disclose or suggest interferometers using beam combining units with fiber optic cable assemblies.

Fuchs discloses an interferometer in which separate light transmitting fibers 8 and 9 such as illustrated in Fig. 1 of Fuchs deliver beams of different frequency to an interferometer unit 12. Fuchs recombines the beams from fibers 8 and 9 for measurement of interference after a measurement beam returns from a measurement reflector 11. For example, beginning at column 3, line 54, Fuchs states, “The partial beams ... are split ... and ... transmitted through monomode light-transmitting fibers 8 and 9 to the input of an interferometer unit 12 containing the measurement reflector 11 in its measurement beam path. ... The interference point 16 of this interferometer unit 12 is situated in the splitter layer of the beam splitter 14. The light coming from this interference point 16 is guided via multimode light-transmitting fibers 17 for conversion into electric signals.”

Nicia is not directed to optical couplers for splitting beams. Nicia fails to disclose a beam combiner or an interferometer.

Of the four references used in this rejection, only Fuchs discloses combining beams from optical fibers, and Fuchs fails to suggest recombination producing a heterodyne beam from which measurement and reference beams are extracted. Further, the combination of Fuchs with Takahashi, Takamiya, and Nicia provides no suggest that a recombining unit with fiber optics would provide a recombined beam of sufficient quality (e.g., with components that are sufficiently collinear) for extraction of measurement and reference beams. To the contrary, Fuchs suggests increased variation in the interfered/recombined beam in that Fuchs discloses using monomode fibers 8 and 9 for

input beams and a multi-mode fiber 17 for the output beam.

The combination of Takahashi, Takamiya, Fuchs, and Nicia also fail to suggest a beam combiner including a manipulator for a fiber optic assembly. Takahashi, Takamiya, and Fuchs fail to mention manipulators. Nicia discloses an optical branch coupler for splitting beams, not combining beams. Further, Nicia provides no suggestion that movable walls 113 and 115 to which fiber connectors 133 and 135 attach are suitable for a beam combiner.

In accordance with an aspect of Applicants' invention, the use of fiber optics allows system components such as lasers and AOMs that produce heat or vibrations to be remote from the interferometer optics, and sending separate beams on separate fibers avoids cross-talk between the polarization components. Further, provision of a recombined heterodyne beam to interferometer optics can facilitate a compact implementation of one or more measurement axes in the interferometer optics. The combination of Takahashi, Takamiya, Fuchs, and Nicia fails to suggest these advantages or Applicants' solution of using a beam combiner with manipulators for one or both of the optical fibers to provide a suitably collinear recombined beam.

For the above reasons, claim 7 and claims 8, 9, and 31-33 are patentable over Takahashi, Takamiya, Fuchs, and Nicia.

Claim 9 further distinguishes over Takahashi, Takamiya, Fuchs, and Nicia by reciting, "the first manipulator is further adjustable to translate the first beam ... to control an incident location of the first beam on the beam combiner." Takahashi, Takamiya, Fuchs, and Nicia fail to suggest use of a manipulator having a direction and location control for beams exiting fibers.

For the above reasons, Applicants request reconsideration and withdrawal of this rejection under 35 U.S.C. § 103.

Claim 30 was rejected under 35 U.S.C. § 103(a) as unpatentable over Takahashi in view of Takamiya, Fuchs, and Nicia and further in view of Kawai. Applicants respectfully traverse the rejection.

Claim 30 depends from claim 7, which is patentable over Takahashi, Takamiya, Fuchs, and Nicia for the reasons given above. The Examiner cites Kawai for teaching use of AOMs in one or two separate paths. However, Kawai when taken in combination with Takahashi, Takamiya, Fuchs, and Nicia still fails to suggest the missing features of claim 7 discussed above.

For the above reasons, Applicants request reconsideration and withdrawal of this rejection under 35 U.S.C. § 103.

In summary, this response to the pending Final Office Action in the above-identified patent application cancels claims 1-6, and amends claim 7 to comply with form requirements. For the above reasons, Applicants respectfully request withdrawal of the final rejection and allowance of the application including claims 7-9 and 30-33.

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Respectfully submitted,



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